

STUDY OF LiMg AND LiMg⁺ USING LASER INDUCED FLUORESCENCE AND TWO-PHOTON IONIZATION

THOMAS D. PERSINGER, JIANDE HAN, MICHAEL HEAVEN, *Department of Chemistry, Emory University, Atlanta, GA, USA.*

Heterodimers consisting of an alkaline and alkaline-earth metal, such as LiMg have the potential for being laser cooled to ultra-cold temperatures. The X1²Σ⁺ ground state of LiMg allows manipulation by both magnetic and electric fields, and its non-zero dipole moment offers the possibility that it could be used in quantum computing devices. Current experimental data on LiMg and LiMg⁺ are sparse^{1,2}. In the present study we used resonance enhanced two-photon ionization spectroscopy (RE2PI) and laser induced fluorescence (LIF) to record rotationally resolved spectra of the X1²Σ⁺, 2²Π and 3²Σ⁺ states. Near-UV spectra previously assigned as E-X and F-X transitions were also reevaluated. Vibrationally resolved spectra of the X1²Σ⁺ and 1²Π state were observed using dispersed LIF. Pulsed-field ionization - zero kinetic energy photoelectron spectroscopy (PFI-ZEKE) was used to determine the ionization energy (IE) and the low-energy states of LiMg⁺. An IE of 4.7695(4) eV for LiMg was found, and vibrationally resolved spectra yielded molecular constants for LiMg⁺ that were consistent with a substantial strengthening of the bond upon ionization.

1. Berry, K.R. and Duncan, M.A., (1997) Photoionization spectroscopy of LiMg. *Chem. Phys. Lett.*, 279, 44-49
2. Pichler, G., Lyra, A.M., Kleiber, P.D., Stwalley, W.C., Hammer, R., Sando, K.M., and Michels, H.H., (1989) Laser-induced chemiluminescence of the lithium-magnesium (LiMg) excimer. *Chem. Phys. Lett.*, 156, 467-71